Obstetric Ultrasound

General Information

- **Transabdominal Ultrasound**: Frequency range of 2-5 MHz.
- **Transvaginal Ultrasound**: Frequency range of 5-9 MHz.
- Increasing frequency means higher resolution but lower penetration depth

First Trimester:

- Utilized for both transabdominal and transvaginal scans.
- The primary tool for evaluating complications.

Indications / uses:

- **Gestational Sac Detection**:
  - **Transvaginal**: Visible at a βHCG level of 1500 mIU/ml (around 5 weeks).
  - **Transabdominal**: Visible at a βHCG level of 6000 mIU/ml (around 6 weeks).
- **Yolk sac diameter measurement**:
  - Essential early structure within the gestational sac. Measured before a fetal pole is visible.
- **Crown-Rump Length (CRL)**:
  - Most accurate measure for dating.
  - Can be measured from the time a fetal pole is visible until 8 weeks.
  - Provides an error margin of only ±3 days.
- **Multiple Gestation**:
  - **T Sign**: Indicates monochorionic twins.
  - **Y Sign**: Indicates dichorionic twins.
- **Dating the Pregnancy**:
  - Initially, mean sac diameter is used for measurement until the CRL can be observed.

- Other indications:
    - Suspected miscarriage.
    - Signs include vaginal bleeding.
    - Suspected uterine abnormalities.
    - Multiple gestations.
    - Hydatidiform mole.
    - Localization of intrauterine devices (IUDs).
    - Evaluation of maternal pelvic masses.
    - Guidance for procedural interventions.

Second Trimester

- **Nuchal Translucency**:
    - It's the subcutaneous fluid behind the fetal neck.
    - Measured between 11-13 weeks.
    - Used to detect aneuploidy and other conditions.
    - Increased thickness (>3 mm) is associated with Down syndrome and other abnormalities.
- **Nuchal Edema**:

  This refers to an abnormal accumulation of fluid in the subcutaneous tissue at the back of the fetal neck. In many cases, this edema may resolve on its own by the second trimester. If the nuchal edema does not resolve, it can be a sign of underlying fetal anomalies such as Down syndrome.
- **Cystic Hygroma**:
- This is a more severe form of nuchal edema where fluid-filled sacs form due to blockages in the lymphatic system. It is often associated with chromosomal abnormalities (e.g., Turner syndrome) and other congenital anomalies.
- To accurately measure nuchal translucency, the ultrasound image should include only the fetal head and upper thorax.

- **Nasal Bone**:
    - Should show three distinct lines.
    1. Top line: Skin
    2. Bottom line: Thicker and more echogenic, indicating the nasal bone.
    3. Third line: Tip of the nose.
    - Absent or underdeveloped in Down syndrome.
- **Fetal Anatomy Scan (18-23 weeks)**:
    - Head Circumference (HC)
    - Biparietal Diameter (BPD)
    - Femur Length (FL)
    - Used to calculate fetal weight, gestational age, and estimated due date (EDD).
- **Cervix Length**:
    - Should be ≥2.5 cm to prevent preterm labor.

Third Trimester

- Typically, for high-risk pregnancies.
- Biparietal Diameter (BPD)
- Head Circumference (HC)
- Femur Length (FL)
- Abdominal Circumference (AC): Most accurate predictor of fetal weight.

- **Amniotic Fluid Index**:
    - Assessed at 18 weeks.
    - Amniotic Fluid Index (AFI): 5-25 cm.
    - Single deepest pocket: 2-8 cm.

How to Assess Amniotic Fluid (AF)

1. **Subjective Assessment**:
    - Visual estimation by the examiner.
2. **Single Deepest Pocket (SDP) Measurement**:
    - Less than 2 cm indicates oligohydramnios.
    - Greater than 8 cm indicates polyhydramnios.
3. **Amniotic Fluid Index (AFI)**:
    - Superior method compared to subjective and SDP measurements.
    - AFI of 5-25 cm is considered normal.
    - Some variability exists due to intra- and inter-observer differences.

- **Placental Position**: Important for delivery planning.
- **Doppler Scan**:
- Umbilical vessels: Assess blood flow.
    - High resistance indicates IUGR.
- Middle cerebral artery.
    - Low resistance indicates fetal anemia.
- Ductus venosus.
    - Normal flow is antegrade (towards the heart).
    - In cases of hypoxia, there is dilation and reversed flow, indicating fetal compromise.
- Abnormal findings include absent or reversed diastolic flow and high resistance flow.

3D/4D Ultrasound

- **3D**: Provides static images for detailed anatomical assessment.
- **4D**: Offers live, real-time imaging for dynamic assessment of fetal movements and behavior.
- **Surface Mode**: Used to visualize the external surface features of the fetus.
- **Transparency Mode**:
    - **Maximum Transparency**: Visualizes bony structures.
    - **Minimum Transparency**: Visualizes vessels.
    - **Inner Parenchyma**: Visualizes internal organ tissues.